Magnum AC Coupled
In a D3R battery box
MND3RACCPLME 7/22/15

SAVE THESE INSTRUCTIONS - These instructions contain important safety and operating instructions for the MidNite Solar Battery Enclosure Size B, D, D3R and E for residential and commercial applications.
If you do not fully understand any of the concepts, terminology, or hazards outlined in these instructions, please refer installation to a qualified dealer, electrician or installer. These instructions are not meant to be a complete explanation of a renewable energy system.

GENERAL PRECAUTIONS
WORKING WITH OR IN THE VICINITY OF A LEAD ACID BATTERY IS DANGEROUS. IT IS VERY IMPORTANT THAT BEFORE SERVICING EQUIPMENT IN THE VICINITY OF LEAD-ACID BATTERIES, YOU REVIEW AND FOLLOW THESE INSTRUCTIONS CAREFULLY.

If service or repair should become necessary, contact MidNite solar Inc. Improper servicing may result in a risk of shock, fire or explosion. To reduce these risks, disconnect all wiring before attempting any maintenance or cleaning. Turning off the inverter will not reduce these risks. Solar modules produce power when exposed to light. When it is not possible to disconnect the power coming from the Photovoltaics by an external means such as a combiner, cover the modules with an opaque material before servicing any connected equipment. Never attempt to charge a frozen battery.

When it is necessary to remove a battery, make sure that the battery bank disconnect breaker is in the off position and that the PV breakers, grid breakers and any other sources of power to the inverter are in the off position. Then remove the negative terminal from the battery first.

To reduce risk of battery explosion follow these instructions and those published by the battery manufacturer as well as the manufacturer of any additional equipment used in the vicinity of the batteries. Before installing the battery enclosure, read all instructions and cautionary markings in or on any connected electrical equipment.

Avoid producing sparks in the vicinity of the batteries. Provide ventilation to clear the area of explosive gases. Sealed AGM and Gel batteries do not under normal conditions create explosive gases. Be especially cautious when using metal tools. Dropping a metal tool onto batteries can short circuit them. The resulting spark can lead to personal injury or damage to the equipment.

Clean all battery terminals. Very high currents are drawn from the batteries; even a small amount of electrical resistance can result in overheating, poor performance, premature failure or even fire.

Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes. Wear complete eye and clothing protection. Always avoid touching eyes while working near batteries. If battery acid or battery terminal corrosion contacts skin or clothing, wash immediately with soap and water. If acid enters the eyes, immediately flood with cool running water for at least 15 minutes and get medical attention immediately. Baking soda neutralizes battery acid electrolyte. Keep a supply near the batteries.

Do not work alone. Someone should be in the range of your voice or close enough to come to your aid when you work with or near electrical equipment.

Remove rings, bracelets, necklaces, watches etc. when working with batteries, photovoltaic modules or other electrical equipment. Power from an illuminated photovoltaic array makes a very effective arc welder with dire consequences if one of the welded pieces is on your person.

To reduce the risk of injury, connect only sealed deep cycle lead acid type rechargeable batteries. Other types of batteries may leak or burst, causing personal injury or damage.

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MidNite Solar's Classic charge controller User's Manual
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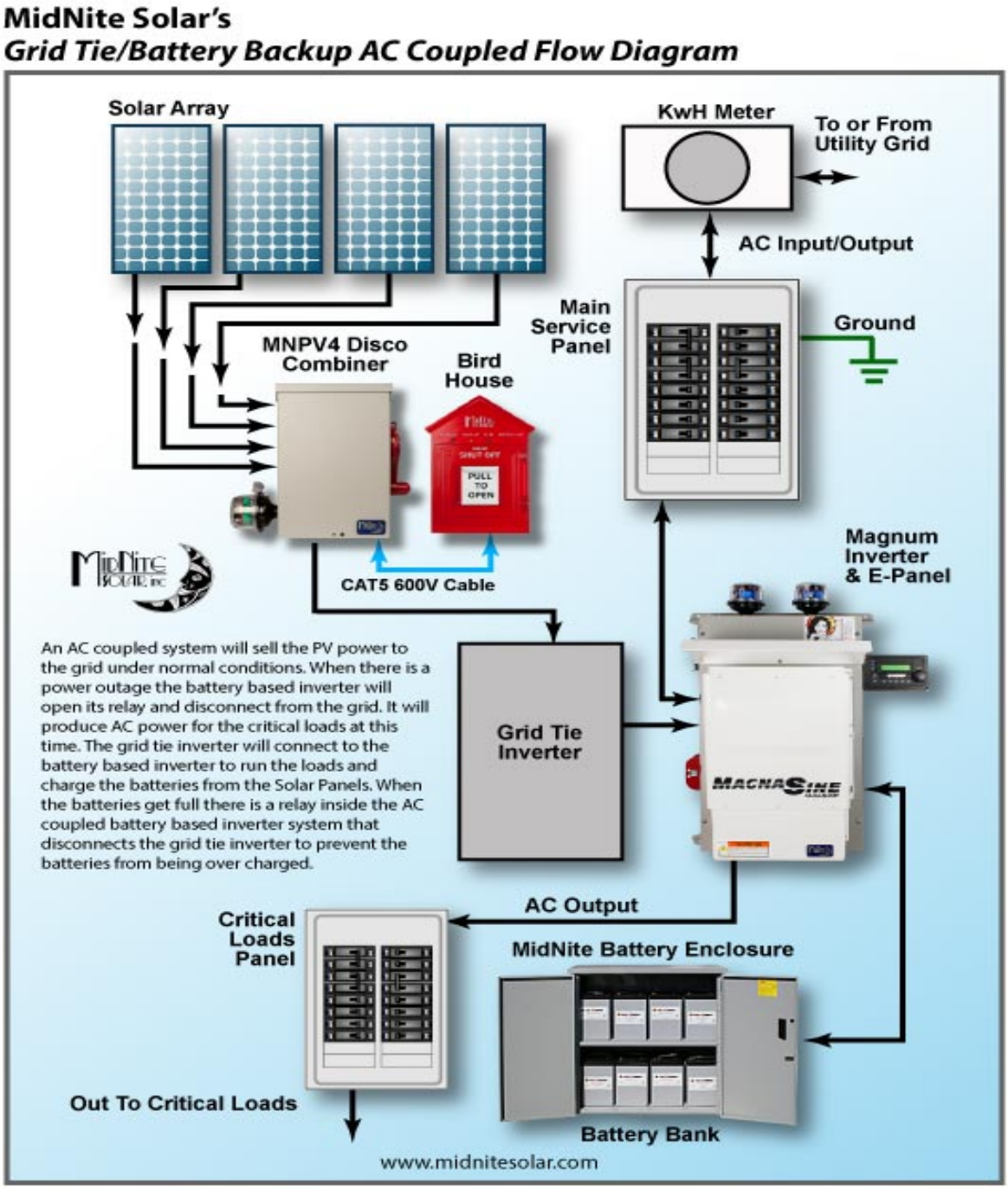
Contact Information
Telephone: 360.403.7207
Fax: 360.691.6862
Email: customerservice@midnitesolar.com
Web: www.midnitesolar.com

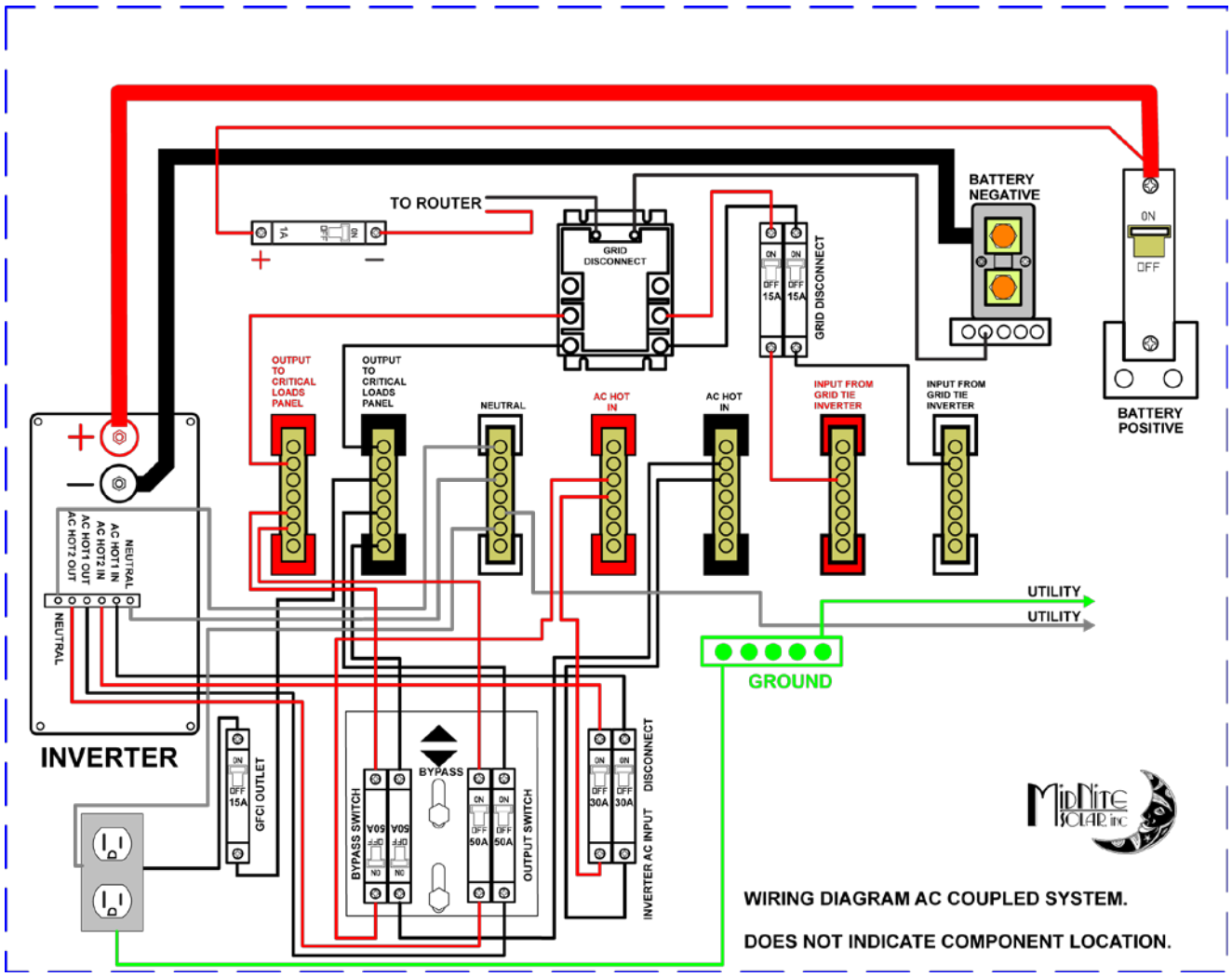
MidNite Solar recommends that this system be installed by a professional electrician due to the interaction with the electrical service on the dwelling. Please consult all Local, State and federal codes that may apply to this install as well as acquire any permits that may be needed. This device is not intended to be relied on for life support.

You will need a “Critical Loads panel” installed for the battery backup system to power when the utility is down. See the drawing below for a basic flow chart of this system.


MidNite Solar's
Grid Tie/Battery Backup AC Coupled Flow Diagram
Solar Array
KwH Meter
To or From Utility Grid
AC Input/Output
Main Service Panel
Ground
MNPV4 Disco Combiner
Bird House
CAT5 600V Cable
Magnum Inverter & E-Panel
An AC coupled system will sell the PV power to the grid under normal conditions. When there is a power outage the battery based inverter will open its relay and disconnect from the grid. It will produce AC power for the critical loads at this time. The grid tie inverter will connect to the battery based inverter to run the loads and charge the batteries from the Solar Panels. When the batteries get full there is a relay inside the AC coupled battery based inverter system that disconnects the grid tie inverter to prevent the batteries from being over charged.
Grid Tie Inverter
AC Output
Critical Loads Panel
MidNite Battery Enclosure
Out To Critical Loads
Battery Bank
www.midnitesolar.com

You will need to find the appropriate location to install the Battery box, both for wiring as well as stability. We recommend if it is to be installed outdoors you try to keep it out of direct sunlight. You will need to secure the box using the mounting holes in the feet. If it is outdoors an appropriate foundation should be installed.

Here is a wiring diagram of the Pre Wired portion of the box as it ships from MidNite.

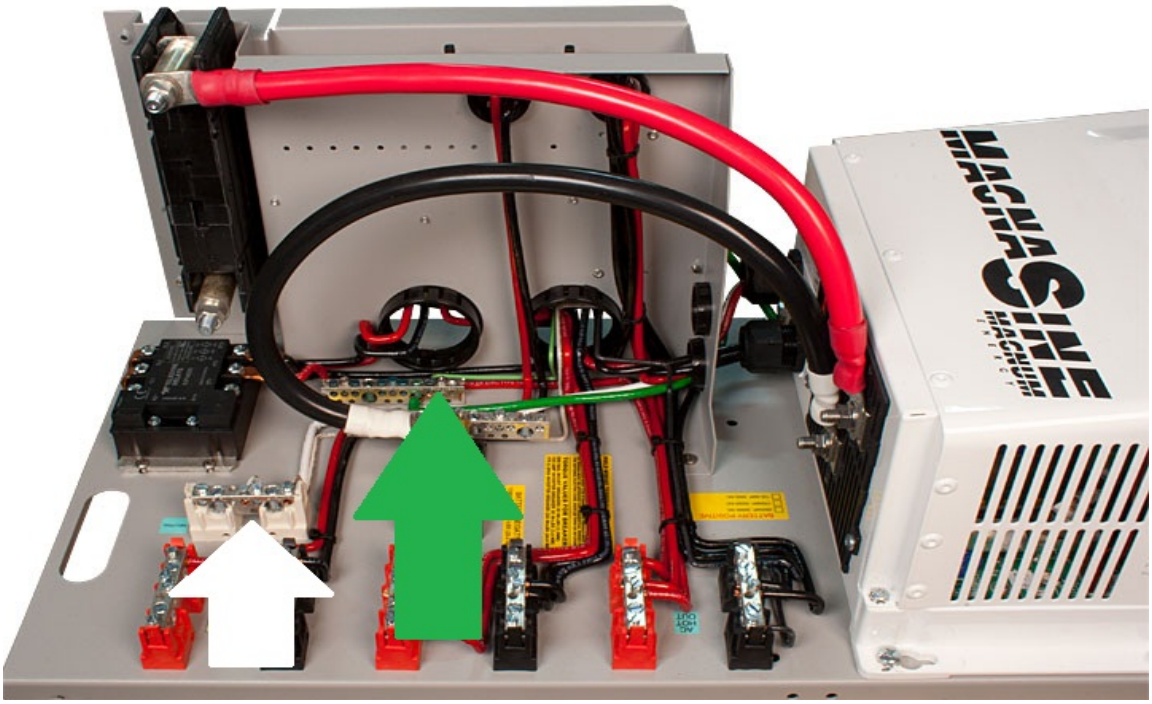


Before starting this project please make sure the Grid tie inverter is off line and make sure you follow all necessary safety precautions. Always shut off all AC power before working on any circuits. Also make sure to switch off the Battery breaker in the AC coupled system before installing batteries.

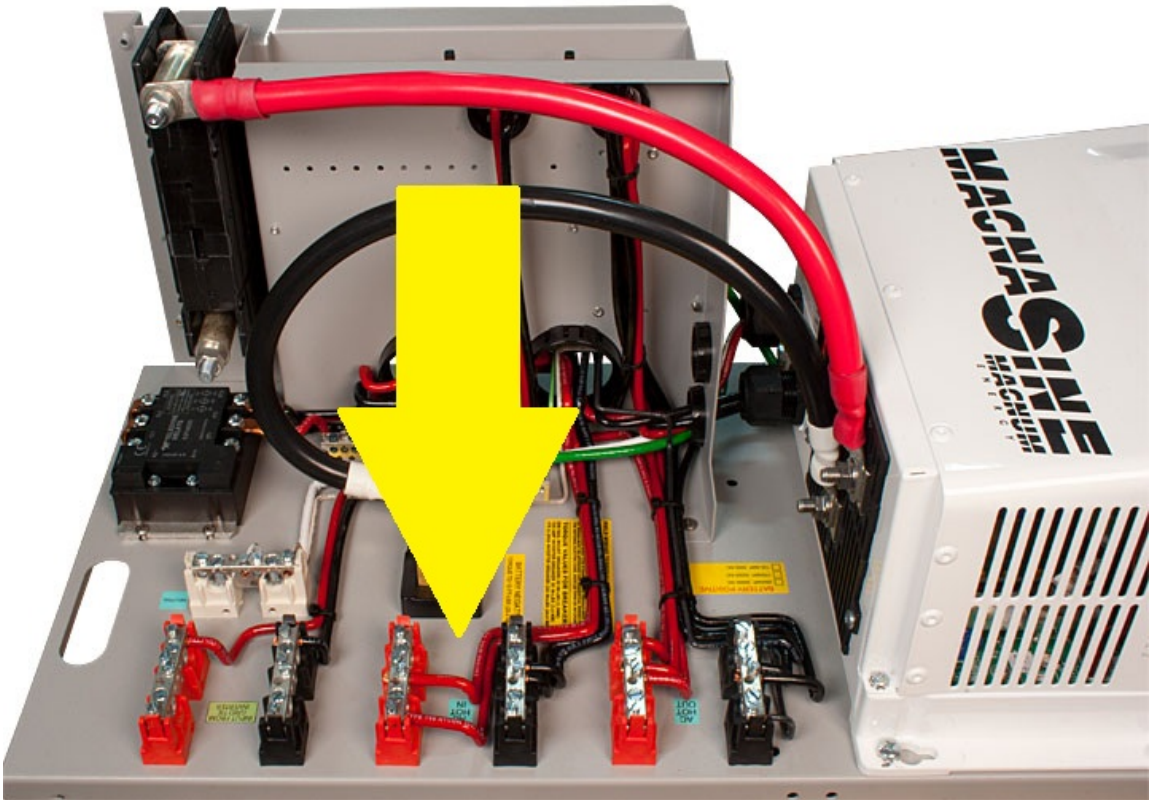
There are 3 distinct electrical connections you need to make to the Pre Wired AC coupled system:

1-A 4 wire 120/240VAC branch circuit 30 amps or less from the utility Main panel to the buss bars Labeled “AC Hot In”
2-A 4 wire 120/240VAC circuit from the buss bars labeled “AC Out to Critical Loads panel” to the sub panel with the critical loads in it. This should be the same ampacity as the feeder in Step 1 above.
3-The 120/240vac circuit from the Grid tied inverter should be removed from the utility main panel and wired to the buss bars labeled “Input from Grid Tie inverter”. Keep in mind this circuit is protected by a 15 amp 120/240VAC breaker in the AC coupled box. The Magnum inverter is limited in the capacity of grid tie it can handle. If the grid tie system is greater than 15 amps at 240VAC please contact customer service at MidNite Solar for help designing the system.

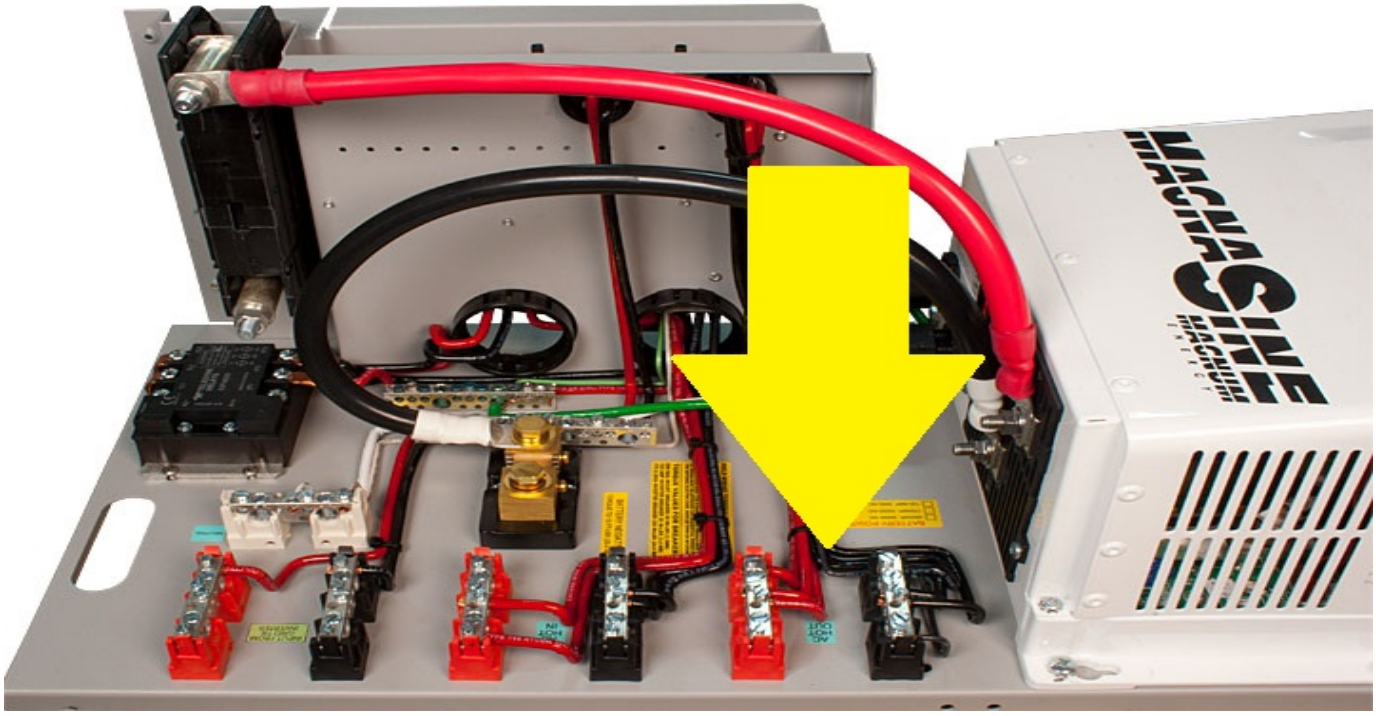
Shown below are the Buss Bars for step 1, this is where the feeder from the utility main panel will connect. The first picture shows the common AC Neutral as well as the Earth ground buss bar. These 2 buss bars will be used in all 3 steps.



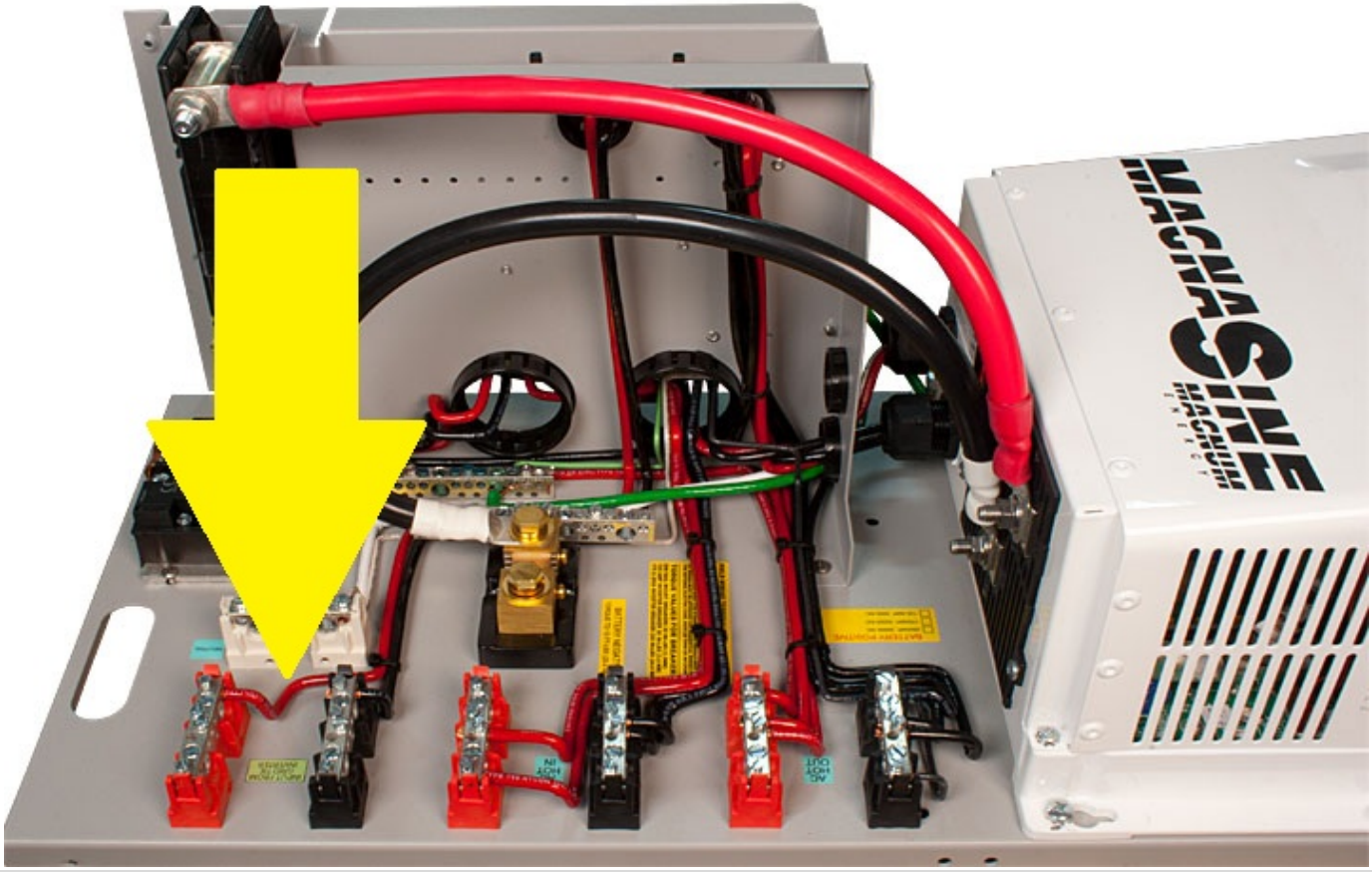
Buss bars for Step 1 AC in from the utility Main panel.



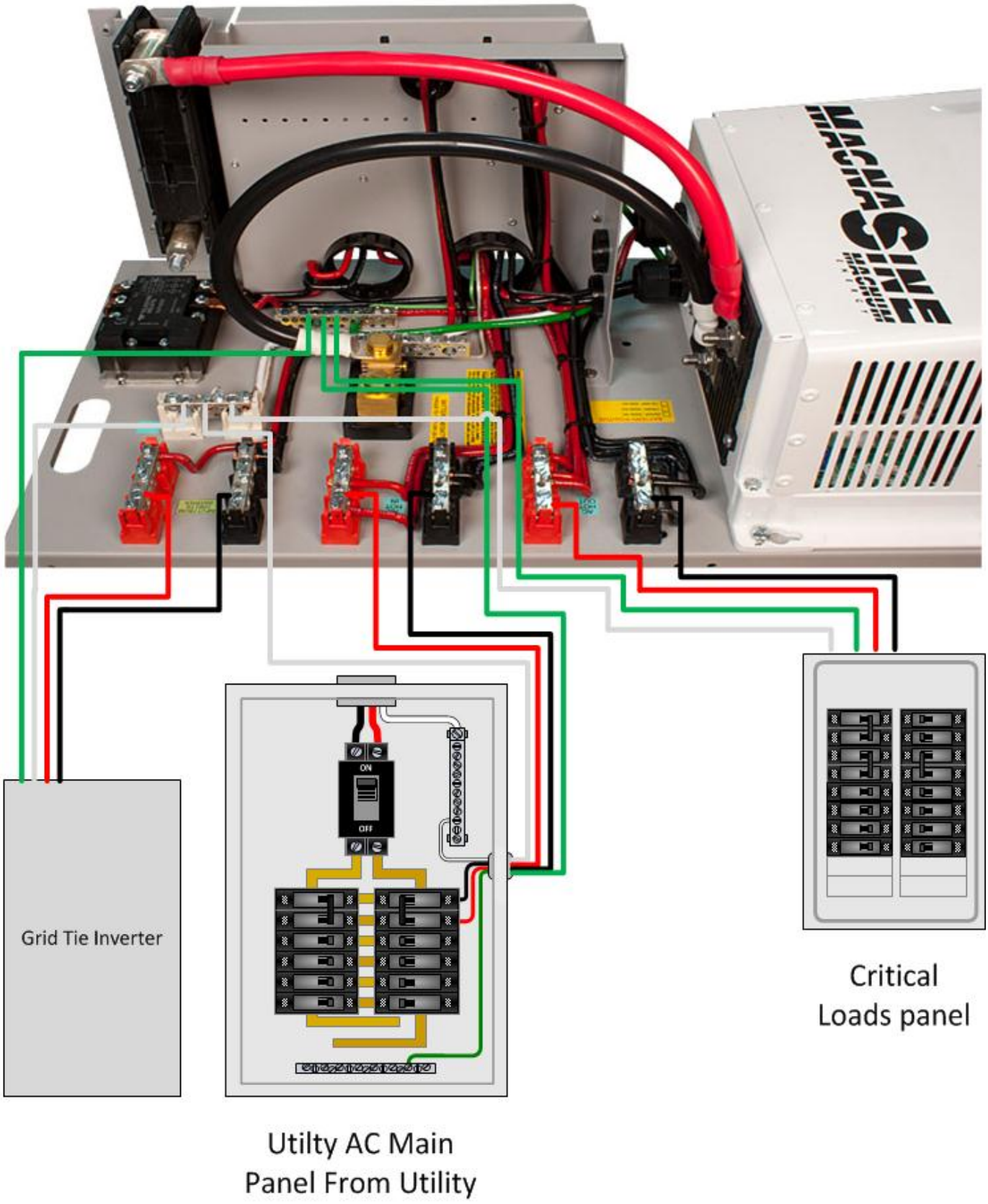
Buss bars for Step 2 AC Out to the Critical Loads panel.



Buss bars for Step 3 AC in from the Grid Tie Inverter.



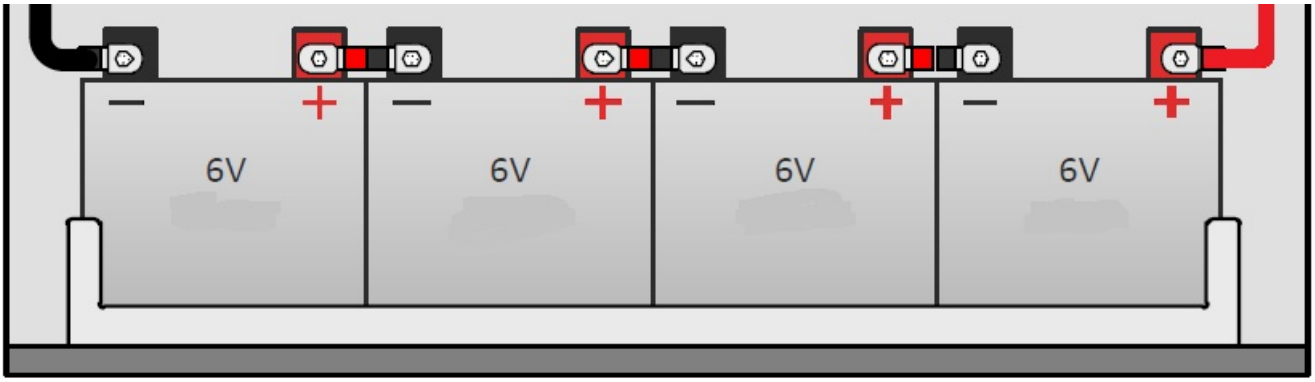
Below is a wiring diagram showing the AC wiring to be done in the field.



Now that all 3 AC wiring steps are complete, we need to wire in the batteries. Batteries require safety precautions when working on or around. Please consult the battery manufacturer's safety instructions before working with the batteries. Always check the polarity of the battery with your voltmeter in case the manufacturer labeled wrong. The Cables are included and as you can see from the picture you simply need to slide the 4 batteries in and connect them in a series string for 24 vdc. We are recommending the Concorde PVX3050T 6 volt batteries for this. For other battery arrangements or larger battery banks please consult with customer service at MidNite Solar.

NOTE: Never used Vented batteries in this system use only SEALED batteries..

As seen above the very Left battery has its Negative terminal to the Left. The series string continues across to the very right battery where the positive terminal is on the far right. The illustration below shows how to wire the 4 batteries.



Now that all the wiring is done we need to power things up. We will start by powering the Magnum inverter on and checking the programming. Shown below is a close up shot of the breakers. Below is an explanation of what they all do and how you want them for Normal operation as well as the sequence for power up.

From Left to Right you have:

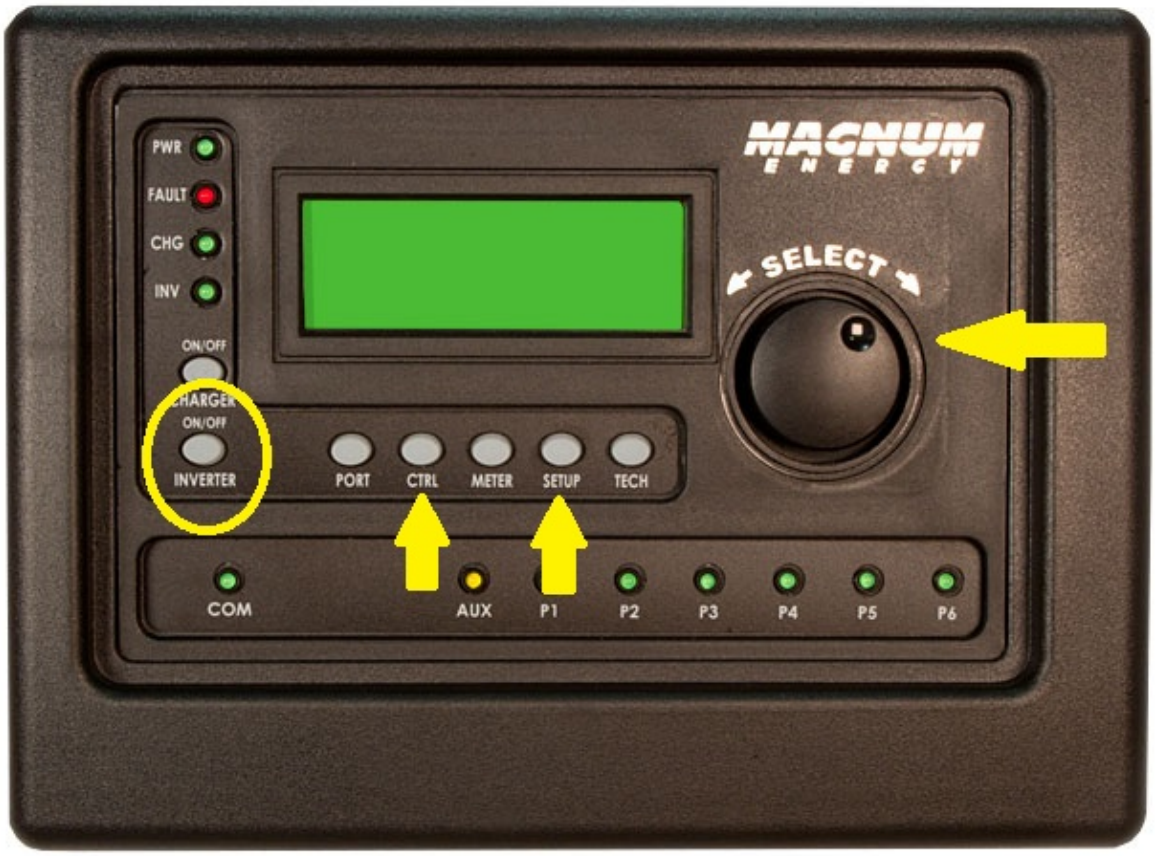
*15 amp 120 vac general use outlet.
*15 amp AC breaker for the general use outlet. (This should be on at all times)
*Invert or Bypass Slider. Up is Normal and down by passes the Magnum inverter. (This will normally always be up)
*30 amp 120/240 Input breaker from the utility main panel. (This would normally always be on)
*15 amp 120/240 Input from the Grid tie inverter. (This will normally be on but leave it off for the initial power up)
*1 amp DC breaker to power the Relay for the Grid tie inverter, this should always be on.
*250 amp DC battery breaker for the Magnum inverter. (This will normally be on but should be off during installation)

At this point we need to turn the Large 250 amp breaker on (The one on the far right) to power up the Magnum inverter. After power up we strongly suggest going through the settings in the Remote for the Magnum to verify everything is set correctly. Below is a picture of the Router. We suggest you consult the Magnum Routers owner's manual for the most up to date info on the Router. To navigate through the 1 through 3 menus follow the steps below.

On initial Power up the Router will ask you to set the time.

To Set the Current Time

1-Turn the Select knob to the hour of day, and then press the Select knob. Make the adjustments by turning the Select knob and when done press the Select knob.
2-Turn the Select knob to the correct minute setting, and then press the Select knob. Make the adjustments by turning the Select knob and when done press the Select knob.
3-Turn the Select knob to the appropriate AM or PM setting, Make the adjustments by turning the Select knob and when done press the Select knob.



Router.

Push the CTRL Button, Turn the Select knob to show 01 AC In Control, Press the Select knob to Edit 01. Scroll the select knob to select “Auto Connect” and press the select knob again.

Push the CTRL Button, Turn the Select knob to show 04 RTR Aux Relay.
Set to “Auto VDC” (push-push-rotate)

Press the SETUP Button, Turn the Select knob to put the arrow on 01 SYSTEM SETUP and press the select knob to enter the SYSTEM menus. To set the menu items scroll to the menu item you need to edit and press the Select knob. Scroll the select knob to change the value and press the select knob to go back to the menus.

Then rotate to:
01F RTR Aux Relay
- Set Open VOLTS = 29.0
- Set Close VOLTS = 26.4
- Set Open DELAY = 1
- Set Close DELAY = 10

READ Appendix D – Using the ME-RTR in an AC Coupled Application in the ME-RTR Manual.

Now press the SETUP Button again, Scroll the Select knob to put the arrow on 2 Inverter and press the select knob to enter the Inverter menus. To set the menu items scroll to the menu item you need to edit and press the Select knob. Scroll the select knob to change the value and press the select knob to go back to the menus.

02A - Search Watts (Set this to OFF)

Now press the SETUP Button again, Scroll the Select knob to put the arrow on 3 Charger and press the select knob to enter the Inverter menus. To set the menu items scroll to the menu item you need to edit and press the Select knob. Scroll the select knob to change the value and press the select knob to go back to the menus.

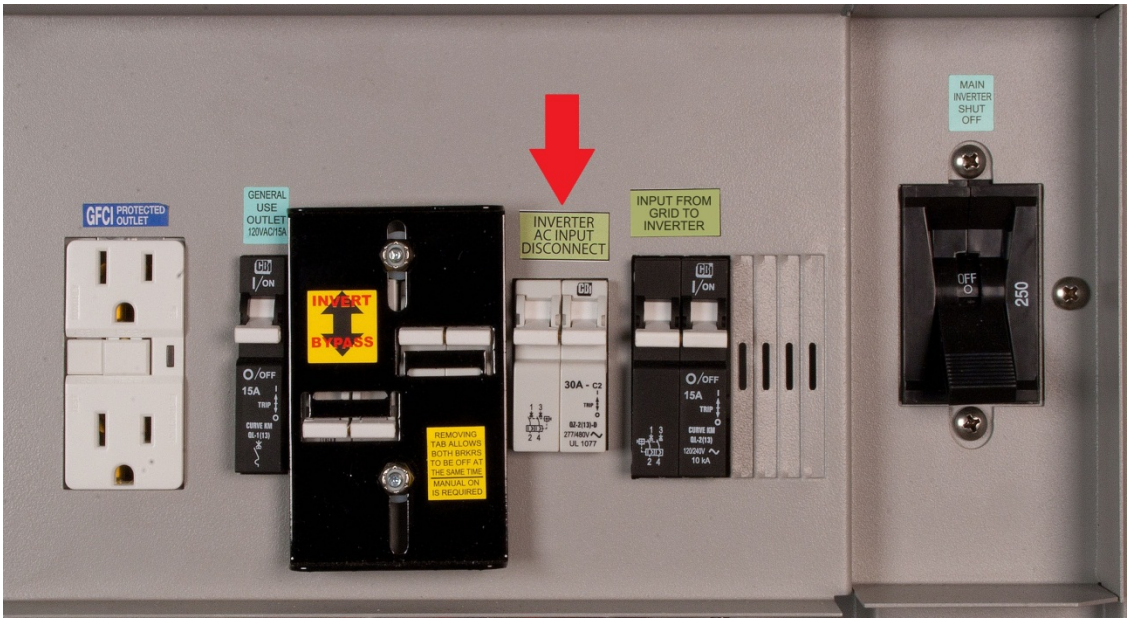
03A - AC Input Amps (30 amps)
03C - Battery Type (AGM 1)
03E - Max Charge rate (20%)
03F - Final Charge Stage (Float)

That concludes the programming. Now you need to turn the inverter on by pressing the Inverter ON/OFF button. Now finish commissioning the system by following the steps below:

*Turn on the AC breaker in the AC Main Panel from the utility (At this point the inverter should connect to the grid and the Critical Loads panel should have power)
*Turn on the Grid tie inverter input breaker and after 5 minutes the grid tie inverter should connect and start working, provided the sun is out ☺

TESTING THE SETUP

After everything is set and everything appears to be in order we suggest running a test when you have time to watch the system through a cycle. To run the test Turn off the Inverter AC input breaker inside the AC Coupled box.



At this time the system should power the critical loads panel from the batteries and the grid tie inverter should be charging batteries. What we want to watch is the Magnum Router screen on the door and keep an eye on the battery voltage. The voltage should rise as the batteries are filled (If the loads are too great on the critical load panel it may not rise, if this is the case turn some loads off) and when the battery voltage rises to the 29.0 we programmed into the AUX relay. When the relay opens the grid tie should drop off and the battery voltage should drop slowly until it reaches the 26.4 volts we programmed at this time the relay should close and 5 minutes later the grid tie system will re-engage.

WARNING: If you see the voltage go above 29 and the relay does not disengage turn off the Grid tie inverter AC input breaker and re check all the settings programmed into the router.

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MidNite Solar Power electronics, sheet metal enclosures and accessories

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MIDNITE SOLAR INC. 17722 67TH AVE NE UNIT C ARLINGTON, WA 98223
Email: info@midnitesolar.com PH: 425-374-9060 FAX: 360-691-6862